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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/748,631	12/30/2003	Alex Nugent	1000-1216	7487

7590 11/15/2007

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EXAMINER	
TRAN, MAI T	

ART UNIT	PAPER NUMBER
2129	

MAIL DATE	DELIVERY MODE
11/15/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/748,631	NUGENT, ALEX	
	Examiner	Art Unit	
	Mai T. Tran	2129	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 July 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

In view of the appeal brief filed on July 25, 2007, PROSECUTION IS HEREBY REOPENED. New grounds of rejection are set forth below.

To avoid abandonment of the application, appellant must exercise one of the following two options:

(1) file a reply under 37 CFR 1.111 (if this Office action is non-final) or a reply under 37 CFR 1.113 (if this Office action is final); or,

(2) initiate a new appeal by filing a notice of appeal under 37 CFR 41.31 followed by an appeal brief under 37 CFR 41.37. The previously paid notice of appeal fee and appeal brief fee can be applied to the new appeal. If, however, the appeal fees set forth in 37 CFR 41.20 have been increased since they were previously paid, then appellant must pay the difference between the increased fees and the amount previously paid.

A Supervisory Patent Examiner (SPE) has approved of reopening prosecution by signing below:

11/13/07

David Vincent
Supervisory Patent Examiner

REQUIREMENTS FOR INFORMATION

Under the requirements of 37 C.F.R. § 1.56 (c) and 1.105, applicant is required to provide detailed laboratory data i.e. test data, detailed written description of such test data including pictures of test setup to demonstrate that the claimed invention has been reduced to practice. A reply that such information is not available will be considered that the claimed invention has not been reduced to practice.

Applicant and Assignee of this application are also required to provide any and all NPL, publications, technical reports written by applicant related to the instant claimed invention i.e. physical neural network utilizing nanotechnology with a learning mechanism applying Hebbian learning.

DOUBLE PATENTING

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

1. Claim **1** (hereinafter "examined claim") is provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims **1, 4, and 5** (hereinafter "copending claims") of copending Application No. **10/969,789**. Although the conflicting claims are not identical, they are not patentably distinct from each other because:

Examined claim 1 is considered to be broader than copending claims 1, 4, and 5. That is, copending claims 1, 4, and 5 fall entirely within the scope of examined claim 1; or in other words, examined claim 1 is anticipated by copending claims 1, 4, and 5.

2. Claim **11, 15, and 16** (hereinafter "examined claims") are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim **24** (hereinafter "copending claim") of copending Application No. **10/735,934**. Although the conflicting claims are not identical, they are not patentably distinct from each other because:

Examined claims 11, 15, and 16 are considered to be narrower than copending claim 24. That is examined claims 11, 15, and 16 fall entirely within the scope of copending claim 24; or in other words, copending claim 24 is anticipated by examined claims 11, 15, and 16.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

CLAIM REJECTIONS - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over McHardy et al (U. S. Patent No. 5,315,162) hereinafter McHardy, and further in view of Liaw et al (U. S. Patent No. 6,363,369) hereinafter Liaw.

Claim 1

McHardy teaches a system, comprising:

a physical neural network configured utilizing nanotechnology (*abstract, lines 1-4, col. 1, lines 8-12, lines 46-55, col. 4, lines 8-30. McHardy discloses copper ions, which have dimensions on the atomic and molecular scale. Therefore, Examiner asserts it reads on nanotechnology of Applicant*), wherein said physical neural network comprises a plurality of nanoconductors suspended and free to move about in a dielectric medium and which form neural connections between pre-synaptic and post-synaptic components of said physical neural network (*abstract, col. 1, lines 29-55, col. 2, lines 45-54, col. 3, lines 44-62, col. 4, lines 8-45, Figs. 1-*

3. The dissolved copper ions will form a conductive path between the terminals creating the connections of the neural network. The moisture film will serve as a dielectric, since it serves as an insulating medium intervening between two conductors (the input and output of the synapse). Moreover, the carbon channel or carbon deposited layer that contains the moisture film is also a dielectric. The precipitation of copper ions will grow copper whiskers (nanoconductors), which will be disposed in the dielectric medium. Pre-synaptic components are the input terminals and post-synaptic components are the output terminals); and

McHardy does not teach a learning mechanism for applying Hebbian learning to said physical neural network.

Liaw teaches a learning mechanism for applying Hebbian learning to a physical neural network (Liaw, col. 13, lines 5-18).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to combine the teachings of McHardy with the learning mechanism for applying Hebbian learning as taught by Liaw for the purpose of having means to govern how the neural network is to adapt its connections to produce a correct input-output mapping.

Claim 9

McHardy in combination with Liaw teach the system of claim 1 wherein said plurality of nanoconductors includes nanoconductors comprising nanowires (*McHardy, col. 1, lines 46-55, col. 4, lines 8-30, col. 7, lines 10-14. Examiner asserts metallic whiskers are nanowires*).

Claim 10

McHardy in combination with Liaw teach the system of claim 1 wherein said plurality of nanoconductors includes nanoconductors comprising nanoparticles (*McHardy, col. 5, lines 10-40. Examiner asserts ion insertion compounds are nanoparticles*).

Claims 2-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over McHardy et al (U. S. Patent No. 5,315,162) hereinafter McHardy, in view of Liaw et al (U. S. Patent No. 6,363,369) hereinafter Liaw, and further in view of Nervegna et al (U. S. Patent No. 6,687,686) hereinafter Nervegna.

McHardy in combination with Liaw do not explicitly teach utilizing voltage gradient, voltage gradient dependencies, pre-synaptic and post-synaptic frequencies to implement Hebbian plasticity and anti-Hebbian plasticity.

Nervegna teaches Hebbian synapse circuit that utilizes voltage gradient, voltage gradient dependencies, pre-synaptic and post-synaptic frequencies to implement Hebbian plasticity and anti-Hebbian plasticity (Nervegna, abstract, col. 2, lines 45-64, col. 3, lines 59-67, col. 4, lines 1-17, lines 23-67, col. 5, lines 1-31, Fig. 15, 15A, 15B, col. 20, lines 7-15).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to combine the teachings of McHardy in combination with Liaw with the Hebbian synapse circuit as taught by Nervegna for the purpose of providing neural computation in a manner which is more realistic.

Claim 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over McHardy et al (U. S. Patent No. 5,315,162) hereinafter McHardy, in view of Liaw et al (U. S. Patent No. 6,363,369) hereinafter Liaw, and further in view of Brandes et al (U. S. Patent No. 6,445,006) hereinafter Brandes.

McHardy in combination with Liaw do not explicitly teach nanoconductors includes nanoconductors comprising nanotubes.

Brandes teaches nanoconductors comprise carbon nanotubes (Brandes, abstract, col. 1, lines 55-62, col. 2, lines 31-37, col. 4, lines 27-58).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to combine the teachings of McHardy in combination with Liaw with the nanoconductors comprising carbon nanotubes as taught by Brandes for the purpose of capitalizing on the semiconducting properties of carbon nanotubes.

Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over McHardy et al (U. S. Patent No. 5,315,162) hereinafter McHardy, in view of Liaw et al (U. S. Patent No. 6,363,369) hereinafter Liaw, and further in view of Nervegna et al (U. S. Patent No. 6,687,686) hereinafter Nervegna.

Claim 11

McHardy teaches a system, comprising:

a physical neural network configured utilizing nanotechnology (*abstract, lines 1-4, col. 1, lines 8-12, lines 46-55, col. 4, lines 8-30. McHardy discloses copper ions, which have dimensions on the atomic and molecular scale. Therefore, Examiner asserts it reads on nanotechnology of Applicant*), wherein said physical neural network comprises a plurality of nanoconductors suspended and free to move about in a dielectric medium and which form neural connections between pre-synaptic and post-synaptic components of said physical neural network (*abstract, col. 1, lines 29-55, col. 2, lines 45-54, col. 3, lines 44-62, col. 4, lines 8-45, Figs. 1-3. The dissolved copper ions will form a conductive path between the terminals creating the connections of the neural network. The moisture film will serve as a dielectric, since it serves as an insulating medium intervening between two conductors (the input and output of the synapse). Moreover, the carbon channel or carbon deposited layer that contains the moisture film is also a dielectric. The precipitation of copper ions will grow copper whiskers (nanoconductors), which will be disposed in the dielectric medium. Pre-synaptic components are the input terminals and post-synaptic components are the output terminals*); and

McHardy does not teach a learning mechanism for applying Hebbian learning to said physical neural network.

Liaw teaches a learning mechanism for applying Hebbian learning to a physical neural network (Liaw, col. 13, lines 5-18).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to combine the teachings of McHardy with the learning mechanism for applying Hebbian learning as taught by Liaw for the purpose of having means to govern how the neural network is to adapt its connections to produce a correct input-output mapping.

McHardy in combination with Liaw do not explicitly teach utilizing voltage gradient, voltage gradient dependencies, pre-synaptic and post-synaptic frequencies to implement Hebbian plasticity and anti-Hebbian plasticity.

Nervegna teaches Hebbian synapse circuit that utilizes voltage gradient, voltage gradient dependencies, pre-synaptic and post-synaptic frequencies to implement Hebbian plasticity and anti-Hebbian plasticity (Nervegna, abstract, col. 2, lines 45-64, col. 3, lines 59-67, col. 4, lines 1-17, lines 23-67, col. 5, lines 1-31, Fig. 15, 15A, 15B, col. 20, lines 7-15).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to combine the teachings of McHardy in combination with Liaw with the Hebbian synapse circuit as taught by Nervegna for the purpose of providing neural computation in a manner which is more realistic.

Claim 13

McHardy in combination with Liaw and Nervegna teach the system of claim 1 wherein said plurality of nanoconductors includes nanoconductors comprising nanowires (*McHardy, col. 1, lines 46-55, col. 4, lines 8-30, col. 7, lines 10-14. Examiner asserts metallic whiskers are nanowires*).

Claim 14

McHardy in combination with Liaw and Nervegna teach the system of claim 1 wherein said plurality of nanoconductors includes nanoconductors comprising nanoparticles (*McHardy, col. 5, lines 10-40. Examiner asserts ion insertion compounds are nanoparticles*).

Claim 15

McHardy in combination with Liaw and Nervegna teach the system of claim 11 wherein said dielectric medium comprises a dielectric liquid (*McHardy, col. 1, lines 46-55, col. 4, lines 8-20. Examiner asserts the moisture film to read on dielectric liquid*).

Claim 16

McHardy in combination with Liaw and Nervegna teach the system of claim 15 wherein said plurality of nanoconductors form physical neural connections when said dielectric medium is exposed to an electric field, such that said physical neural connections can be strengthened or weakened depending upon a strengthening or weakening of said electric field or an alteration of a frequency thereof (*McHardy, col. 1, lines 46-55, col. 4, lines 21-45, col. 7, lines 6-18. Examiner asserts applying a voltage across the anode and cathode will create an electric field. Moreover, an electric field exists where there is current density*).

Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over McHardy et al (U. S. Patent No. 5,315,162) hereinafter McHardy, in view of Liaw et al (U. S. Patent No. 6,363,369) hereinafter Liaw, in view of Nervegna et al (U. S. Patent No. 6,687,686), and further in view of Brandes et al (U. S. Patent No. 6,445,006) hereinafter Brandes.

McHardy in combination with Liaw and Nervegna do not explicitly teach nanoconductors includes nanoconductors comprising nanotubes.

Brandes teaches nanoconductors comprise carbon nanotubes (Brandes, abstract, col. 1, lines 55-62, col. 2, lines 31-37, col. 4, lines 27-58).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to combine the teachings of McHardy in combination with Liaw and Nervegna with the nanoconductors comprising carbon nanotubes as taught by Brandes for the purpose of capitalizing on the semiconducting properties of carbon nanotubes.

CLAIM REJECTIONS - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 17-18 and 20 are rejected under 35 U.S.C. 102(b) as being anticipated by McHardy et al (U. S. Patent No. 5,315,162) hereinafter McHardy.

Claim 17

McHardy teaches a system, comprising:

a plurality of molecular conductors disposed in and free to move about within a dielectric medium comprising a dielectric solvent or a dielectric solution (*abstract, col. 1, lines 29-55, col. 2, lines 45-54, col. 3, lines 44-62, col. 4, lines 8-45, Figs. 1-3. The dissolved copper ions will form a conductive path between the terminals creating the connections of the neural network. The moisture film will serve as a dielectric, since it serves as an insulating medium intervening between two conductors (the input and output of the synapse). Moreover, the carbon channel or carbon deposited layer that contains the moisture film is also a dielectric solvent. The precipitation of copper ions will grow copper whiskers (molecular conductors), which will be disposed in the dielectric medium*);

at least one input electrode in contact with said dielectric medium (*abstract. Examiner asserts input terminal to read on input electrode*); and

at least one output electrode in contact with said dielectric medium, wherein said plurality of molecular conductors form physical neural connections when said dielectric medium is exposed an electric field across said at least one input electrode and said at least one output electrode, such that said physical neural connections can be strengthened or weakened depending upon a strengthening or weakening of said electric field or an alteration of a frequency thereof (*McHardy, col. 1, lines 46-55, col. 4, lines 21-45, col. 7, lines 6-18. Examiner asserts applying a voltage across the anode and cathode will create an electric field. Moreover, an electric field exists where there is current density*).

Claim 18

McHardy teaches the system of claim 17 further comprising a physical neural network comprising said plurality of molecular conductors disposed within said dielectric medium comprising said dielectric solvent or said dielectric solution, said at least one input electrode in contact with said dielectric medium, and said at least one output electrode in contact with said dielectric medium (*abstract, col. 1, lines 29-55, col. 2, lines 45-54, col. 3, lines 44-62, col. 4, lines 8-45, Figs. 1-3. The dissolved copper ions will form a conductive path between the terminals creating the connections of the neural network. The moisture film will serve as a dielectric, since it serves as an insulating medium intervening between two conductors (the input and output of the synapse). Moreover, the carbon channel or carbon deposited layer that contains the moisture film is also a dielectric solvent. The precipitation of copper ions will grow copper whiskers (molecular conductors), which will be disposed in the dielectric medium*).

Claim 20

McHardy teaches the system of claim 18 wherein said physical neural network is configured as an integrated circuit chip utilizing nanotechnology (*Fig. 1*).

CLAIM REJECTIONS - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over McHardy et al (U. S. Patent No. 5,315,162) hereinafter McHardy as applied to claims 17-18 above, and further in view of Liaw et al (U. S. Patent No. 6,363,369) hereinafter Liaw.

McHardy does not teach a learning mechanism for applying Hebbian learning to said physical neural network.

Liaw teaches a learning mechanism for applying Hebbian learning to a physical neural network (Liaw, col. 13, lines 5-18).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to combine the teachings of McHardy with the learning mechanism for applying Hebbian learning as taught by Liaw for the purpose of having means to govern how the neural network is to adapt its connections to produce a correct input-output mapping.

McHardy in combination with Liaw do not explicitly teach utilizing voltage gradient, voltage gradient dependencies, pre-synaptic and post-synaptic frequencies to implement Hebbian plasticity and anti-Hebbian plasticity.

Nervegna teaches Hebbian synapse circuit that utilizes voltage gradient, voltage gradient dependencies, pre-synaptic and post-synaptic frequencies to implement Hebbian plasticity and anti-Hebbian plasticity (Nervegna, abstract, col. 2, lines 45-64, col. 3, lines 59-67, col. 4, lines 1-17, lines 23-67, col. 5, lines 1-31, Fig. 15, 15A, 15B, col. 20, lines 7-15).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to combine the teachings of McHardy in combination with Liaw with the Hebbian synapse circuit as taught by Nervegna for the purpose of providing neural computation in a manner which is more realistic.

RESPONSE TO ARGUMENTS

Applicant's arguments with respect to claims 1-20 have been considered but are moot in view of the new ground(s) of rejection.

CONCLUSION

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

1. Jackson et al, U. S. Patent No. 6,536,106 discloses electric field assisted assembly process.
2. Burns et al, U. S. Patent No. 6,763,340 discloses microelectromechanical system artificial neural network device.

CORRESPONDENCE INFORMATION

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mai T. Tran whose telephone number is (571) 272-4238. The examiner can normally be reached on 10:00 am - 6:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David R. Vincent can be reached on (571) 272-3080. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

M.T.T
Patent Examiner

David Vincent 11/13/07
David Vincent
Supervisory Patent Examiner
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